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WATER QUALITY BUREAU

MONTANA DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES

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MONTANA WELLHEAD PROTECTION PROGRAM

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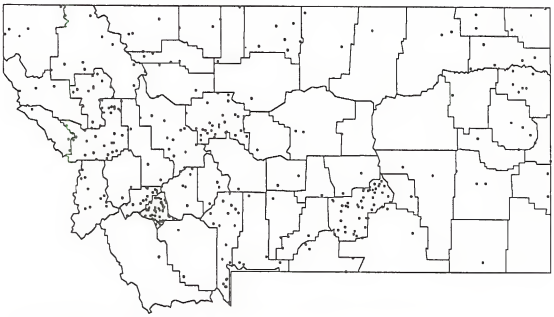
MONTANA WELLHEAD PROTECTION PROGRAM

BACKGROUND

Montana is the fourth largest state (147,046 square miles) in the United States with a population density of 5.5 per square mile. Figure 1 shows how the population is distributed around the state. Montana is a rural state with only six urban centers; the largest of which is Billings at 81,150 people. The majority of the people live in small communities in the alluvial valleys. The average public water supply serves fewer than 100 inhabitants.

Figure 1 Population Density of Montana



Population Density of Montana (Dot equals one person per square mile)

The continental climate of low humidity and cold temperatures varies across the state. The western mountains are influenced by Pacific fronts which make the weather milder and more humid. The mountain valleys are subject to temperature inversions in the winter. The Rocky Mountain front is drier and subject to high winds. Annual precipitation varies from 8 inches in the valleys to 120 inches in the mountains. The eastern plains are subject to Arctic fronts and hot, dry summers. Annual precipitation varies from 12 to 30 inches.

The principal industries are agriculture, timber, mining, tourism, oil and gas. The principal manufactured goods are food products, wood and paper products, primary metals, printing and publishing, petroleum and coal products. The chief crops are wheat, barley, sugar beets, hay, and oats. Livestock produced are cattle, hogs, sheep, and poultry.

The employment distribution in 1988 was 26% service, 22% trade, 19% government, 8% agriculture, and 6% manufacturing. Per capita income in 1989 was $13,852.

The continental divide bisects the state. The eastern portion is drained by the Missouri and Yellowstone rivers. The Kootenai and Clark Fork rivers drain the northwestern area.

Montana has two distinct hydrogeologic regimes as shown in Figure 2. Western and south-central Montana are located in the Northern and Middle Rocky Mountains physiographic provinces that generally consist of a series of mountain ranges separated by intermontaine valleys containing significant deposits of basin-fill sediments. Annual precipitation, mostly in the form of snow, provides fresh water recharge to both surface and groundwater systems. Unconsolidated sand and gravel aquifers yield large volumes of high quality water to wells that are generally less than 150 feet deep.

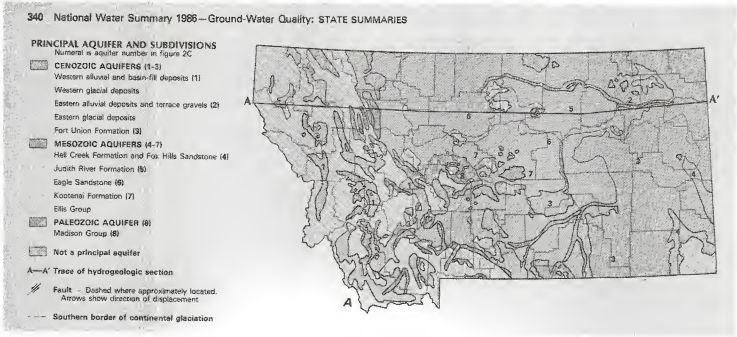
Figure 2 Physiographic Diagram

Eastern and north-central Montana are located in the Great Plains physiographic province. This area receives much less precipitation, therefore less fresh water recharges the aquifers. Consolidated sandstone and siltstone aquifers in eastern Montana are fine-grained and the water is often of lower quality. Wells penetrating these aquifers tend to be deeper than 150 feet and lower in yield than alluvial aquifer wells. Parts of the northern Great Plains have been glaciated. Figure 3 shows the location of the principal aquifers.

About 54% of Montana's population uses groundwater for domestic purposes. Of the 2,264 public water supplies, all but 98 rely on groundwater. Groundwater provides drinking water for 620 communities, 24 water districts, 146 schools, and 1,176 restaurants, campgrounds, motels, ski slopes, etc. Over 75% of these public water supplies obtain their groundwater from Quaternary alluvial aquifers. Of the total amount of groundwater used in Montana, 54 Mgal/day (27%) is for public water supplies, 14 Mgal/day (7%) is for rural domestic use, 94 Mgal/day (48%) is for irrigation, 9 Mgal/day (4%) is for stockwater use, and 29 Mgal/day (14%) is for industrial use[1].

For the most part, groundwater in Montana has not been degraded by human-caused contamination. However, natural substances lower the water quality of many of the consolidated aquifers. Concentrations of dissolved solids commonly exceed the national secondary drinking water standard of 500 milligrams per liter (mg/l) especially in the eastern aquifers. Dissolved solids can range from 400 to 5,000 mg/l in eastern Montana and 100 to 200 mg/l in western Montana[2].

Figure 3 Principal Aquifers


340 National Water Summary 1988—Ground-Water Quality: STATE SUMMARIES
PRINCIPAL AQUIFER AND SUBDIVISIONS
Numeral is aquifer number in figure 2C
CENOZOIC AQUIFERS (1-3)
Western alluvial and basin-fill deposits (1)
Western glacial deposits
Eastern alluvial deposits and terrace gravels (2)
Eastern glacial deposits
Fort Union Formation (3)
MESOZOIC AQUIFERS (4-7)
Hell Creek Formation and Fox Hills Sandstone (4)
Judith River Formation (5)
Eagle Sandstone (6)
Kootenai Formation (7)
Ellis Group
PALEOZOIC AQUIFER (8)
Madison Group (8)
Not a principal aquifer
A—A' Trace of hydrogeologic section
Fault—Dashed where approximately located. Arrows show direction of displacement
Southern border of continental glaciation
A
A'

Montana has eight Superfund hazardous waste sites that are listed on the National Priority List. Approximately 234 sites are targeted for investigation by the state Comprehensive Environmental Cleanup and Responsibility Act (MCA[3] 75-10-701). These sites include refineries, wood treating operations, mining sites, hazardous waste generators, landfills, airports, fuel tank sites, railroads, chemical plants, and salvage yards.

Sources of contaminants that pose major threats to Montana's groundwater are underground storage tanks, injection wells, septic tanks, spills and unanticipated releases, abandoned hazardous waste sites, mineral processing, and agricultural activities. Other sources are municipal landfills, industrial landfills, oil and gas brine pits, and road salting. Specific contaminants of concern are volatile and semivolatile organic chemicals, nitrates, bacteria, brine/salinity, heavy metals and arsenic, pesticides, and petroleum products.

Groundwater Management Strategy. In March, 1992, the Groundwater Quantity/Quality Steering Committee of the Water Policy Committee of the legislature surveyed the groundwater quality issues. They identified five major issues:

> **Issue 1 - Coordinate Quantity and Quality Permitting.** Presently, permits are granted independently by Department of Health and Environmental Sciences (DHES) and Department of Natural Resources and Conservation (DNRC) without considering cumulative impacts of these actions. Options were recommended to allow DNRC to consider water quality, develop a process to notify discharge permit holders, establish a process to consider quantity in quality permits, allow state and local agencies to petition

for controlled groundwater areas, amend controlled groundwater area statutes to allow showing of contaminant migration or degradation, and develop pollution source tracking system.

Issue 2 - Long-term Planning. Presently, there is a lack of comprehensive, long-term groundwater quality/quantity management. Options were recommended to establish a state groundwater coordination committee, develop a state comprehensive groundwater program, assist conservation districts with local water management planning, and support funding for the groundwater assessment program.

Issue 3 - Well Construction Enforcement. Well construction standards are not adequately enforced presently. Options were recommended to develop a driller notification program.

Issue 4 - Unplugged Holes. Mineral exploration, geotechnical, and seismic drill holes presently are not constructed and plugged to assure groundwater contamination will not occur. Options were recommended to develop a hole-plugging program and inventory, develop consistent hole-plugging requirements, and allocate Resource Indemnity Trust funds to plug holes.

Issue 5 - Protection from Mining Impacts. Presently, both groundwater quality and quantity are being adversely affected by mining activities. Options were recommended to amend rules to reflect guidelines for hydrologic studies and encourage mining companies to obtain early public input.

Issue 6 - Information/Education. Presently, groundwater information is not readily available. Options were recommended to request the WET (Water Education for Teachers) program to include water quality/quantity information, distribute DNRC well brochures, develop public service announcements, and provide a toll-free number to answer or direct water questions.

Wellhead Protection Strategy. The goal of the Montana Wellhead Protection Program was developed by the Wellhead Protection Advisory Committee and the staff of the Water quality Bureau.

- The Montana Wellhead Protection Program will be a voluntary program that emphasizes local control. Because remediation of groundwater contamination is not economically viable, prevention of contamination is better than remediation. Education of the general public and training for professionals working with drinking water systems will be emphasized in the development of Montana's Wellhead Protection Program.

- The Water Quality Bureau of the DHES will provide coordination and technical assistance, provide information and education for those who get their drinking water from wells, and encourage public participation in the development and implementation of the program. Wellhead protection will address groundwater aquifers used by public drinking water supplies and tapped by wells, infiltration galleries, radial collection wells, and springs.

While Montana is a large state, the relative area that requires intense management is only about 20%. Most public water supplies are located in the alluvial aquifers in the river valleys.

Montana's Wellhead Protection Program ranks the aquifers for protection activities according to their vulnerability and the total population using the aquifer. The unconfined aquifers rank first; semiconfined aquifers rank second, and confined aquifers rank third.

INTRODUCTION

Purpose and Scope

The 1986 Amendments to the Safe Drinking Water Act authorized state programs to establish wellhead protection areas. Each state program is submitted to the Environmental Protection Agency (EPA) for review. The program will be approved if it is adequate to protect wellhead areas, within the state's jurisdiction, from contaminants that may have an adverse effect on the health of those drinking the water. The purpose of this document is to fulfill these provisions of Section 1428 of the Safe Drinking Water Act.

The scope of the Montana Wellhead Protection Program incorporates the following elements: A) Roles and duties of state agencies, local governments, and public water suppliers are clearly defined. B) Wellhead protection areas are determined based on reasonably available aquifer information. C) Within the wellhead protection areas, all sources of health threatening contamination that may pollute the groundwater are identified. D) Management of the wellhead protection areas strives to assure that public water supplies will not become contaminated. E) Contingency plans are developed to assure alternative drinking water supplies in case a well becomes contaminated. F) New well sites are selected to maximize yield and minimize potential contamination. G) The public is involved at all levels of plan development and implementation.

Program Summary

The draft Montana Wellhead Protection Program is being submitted for EPA approval in compliance with Section 1428 of the 1986 Amendments to the Safe Drinking Water Act. This law requires that states adopt a program to protect groundwater, used as public drinking water supplies, from contaminants which may have any adverse effect on human health. The Water Quality Bureau, DHES, has been authorized to implement this program. Montana's program will cover all lands within the state, both public and private, except the seven Indian reservations.

The Montana Wellhead Protection Program will be a voluntary program that emphasizes local control. Because remediation of groundwater contamination is not economically viable, prevention of contamination is better than remediation. Education of the general public and training for professionals working with drinking water systems will be emphasized in the development of Montana's Wellhead Protection Program.

The Montana Wellhead Protection Program will be evaluated on seven criteria:

1. Does the program define the roles and duties of state agencies and local governments, as well as provide for coordination?

2. Does the program select delineation methods suitable to define wellhead protection areas based on reasonably available aquifer information?

3. Does the program provide for an inventory of potential sources of contamination within the wellhead protection areas and a method to compile the information for statewide use?

4. Does the program provide for effective management of the wellhead protection areas to assure that public water supplies will not become contaminated?

5. Does the program outline contingency plans to assure alternative drinking water supplies in case a well becomes contaminated?

6. Does the program assure that new well sites are selected to maximize yield and minimize potential contamination?

7. Does the program involve the public at all levels of plan development and implementation?

Roles and Duties of State and Local Government

- Local government participation in the Montana Wellhead Protection Program is voluntary. A local government entity that elects to establish a wellhead protection area around its public water supply well or spring will coordinate delineation of the wellhead protection area and the inventory of potential contaminant sources, provide and administer the funding, manage the protection area, and plan for future water supplies.

- The Water Quality Bureau, DHES will coordinate the Montana Wellhead Protection Program with local governments, other state and federal agencies, Indian tribal governments, bordering states and Canada.

- Technical assistance will be provided to local governments by the Water Quality Bureau, the Montana Bureau of Mines and Geology (MBMG), the Water Management Bureau of the DNRC, and the Natural Resource Information System (NRIS) of the State Library. Technical assistance will include delineation of the wellhead protection area and risk analysis of the aquifer's susceptibility to contamination.

- A Technical Guide for local communities will be prepared jointly by the Water Quality Bureau and MBMG. The guide will list the requirements for certification of the wellhead protection area by the Water Quality Bureau. Certification of the wellhead protection area is required for the community to apply for susceptibility and use waivers to monitoring requirements established by the EPA or to nominate lands within the wellhead area for the Conservation Reserve Program (CRP).

Delineation of Wellhead Protection Areas

- Wellhead protection in Montana will address aquifers tapped by wells, infiltration galleries, radial collection wells, and springs that serve public drinking water supplies. Over 75% of these supplies obtain groundwater from Quaternary alluvial aquifers.

- Montana's public water supplies from groundwater sources will be separated into three groups. Group 1 will be noncommunity public water supplies serving a population of 25 or more people. Group 2 will be public water supplies having 10 to 4,999 service connections. Group 3 will be public water supplies having 5,000 or more service connections.

- Group 1 may delineate a wellhead protection area by including the area at least 100 feet around the wellhead. Where greater protection is appropriate due to the vulnerability of the water supply, the area may extend to at least 2,500 feet around the wellhead. This group may opt to use any other method of delineation to define their wellhead protection area more scientifically.

- Group 2 may delineate a wellhead protection area nearest to the well as specified for Group 1. A second management area should extend out to the physical and hydrologic boundaries that limit groundwater flow into the well or should be defined as the area of groundwater flow that will enter the well within 100 days of continuous pumping. This group may opt to use any other method of delineation to define their wellhead protection area more scientifically.

- Group 3 may delineate a wellhead protection area nearest to the well and a second management area as specified for Group 2. If a specific contaminant is known to threaten a public water supply, a third management area should extend beyond the area needed to intercept or dilute the contaminant before it enters the well. This group may opt to use any other method of delineation to define their wellhead protection area more scientifically.

- In bedrock or confined aquifers, which are used by less than 25% of the municipal water supplies, the wellhead protection area nearest to the well or spring will be defined as specified for Group 1. For Groups 2 and 3, a second management area should extend out to the physical and hydrologic boundaries that limit groundwater flow into the well

or spring. Groups drawing water from these aquifers, may opt to use any other method of delineation to define their wellhead protection area more scientifically.

Inventory of Potential Contamination Sources

- Potential sources of contamination in the wellhead protection area will be inventoried by the local government preferably using volunteer help from the senior citizens in the community.

- The inventory will group potential contaminant sources according to whether they exist on the land surface, in the soil above the water table, or below the water table.

- To certify the wellhead area, the results of the inventories will sent to the Natural Resource Information System (NRIS) to be compiled for statewide use. The information acquired will be analyzed by the Water Quality Bureau to evaluate the potential risk to the state's aquifers and to suggest appropriate management options to prevent contamination.

- The inventory of each certified wellhead protection area will be updated every five years and submitted to NRIS.

Management Approaches

- On the state level, coordination, technical assistance, education, and risk assessment will be the methods used to manage the statewide program. Public education, information dissemination, and water supply operator training will be the most conspicuous part of the program. The Water Quality Bureau will work closely with private and public organizations interested in promoting groundwater protection.

- On the local level, management options include but are not limited to developing design and operating standards, encouraging the use of best management practices and other voluntary actions, purchasing property and development rights, creating a local water quality district, monitoring groundwater quantity and quality, educating the public, passing zoning ordinances, regulating subdivision development, reviewing site plans, instituting source prohibitions and permits, and petitioning for sole source aquifer designation.

- As local governments identify areas where legislation is needed to allow them to effectively manage their wellhead protection areas, the Water Quality Bureau will coordinate the introduction of such legislation and support its passage.

- In order to certify the wellhead protection area with the Water Quality Bureau, the managing government entity should set goals and time frames for gauging the success of

their protection efforts. The community should develop a management plan to assure the site and groundwater does not become contaminated.

Development of Contingency Plans

- The Department of Military Affairs, Disaster and Emergency Services Division and the DHES will coordinate federal, state, and local services during emergencies.

- Disaster and emergency services at the county level will respond to protect public health during natural or human-caused disasters or emergencies. In addition, they are charged with promoting disaster prevention, planning, training, public education, and development of a comprehensive disaster and emergency plan. They also maintain a survey of industries, resources, and facilities within the state.

- The Water Quality Bureau, in conjunction with the Department of Military Affairs, maintains a Hazardous Materials Emergency Response System. The phone number is 444-6911 and is staffed 24 hours a day. All spills or releases of hazardous materials or other wastes, regardless of size, that pollute or threaten to pollute state waters must be reported, contained, removed and disposed of to protect water quality.

- Long-term response to a disaster usually involves testing the public water supply and providing a community with potable water if their water supply is contaminated. New sources would be developed if the old supply must be abandoned.

New Wells

- Construction standards for new wells are currently being revised and incorporated into rules by the Board of Health and Environmental Sciences. For new public water supply wells, the rules will require the submission of plans and specifications to the Water Quality Bureau prior to construction. Consultation will occur on proposed well location and the potential for contamination within an area 2,500 feet around the new well. The regulations will require that the water supply system control a 100-foot radius around the well by ownership, zoning, easements, lease, or other means.

- Each public water supply, not currently grandfathered from the proposed revisions, must have two sources of water supply. One acts as a back up when the other is down for maintenance or repair.

- Before anyone can drill a new well that will yield more than 35 gallons per minute, the owner must obtain a permit to appropriate water from the DNRC.

- In order to certify a wellhead protection area, alternative locations for new wells should be sought. The area within a 2,500-foot radius of each location should be inventoried for potential sources of contamination. The community should develop a management

plan to assure the site and groundwater does not become contaminated. If the community owns or controls the site, they should prohibit new sources of potential contamination being placed near the site. The community should seek a water right reservation from DNRC.

Public Participation

- The Board of Health and Environmental Sciences oversees the activities of the DHES. The board will establish any regulations needed to implement the Montana Wellhead Protection Program.

- In May 1991, the Director of the DHES appointed a Wellhead Protection Advisory Committee to recommend a program uniquely suited to Montana. The committee meets quarterly and the meetings are open to the public.

- Copies of the *Montana Wellhead Protection Program* are available for public review at all Montana public libraries. Copies of this summary were mailed to all public water supply systems and interested members of the public. Public meetings are scheduled for Helena, Great Falls, Kalispell, Missoula, and Billings in May and June.

- A public hearing will be held on July 10, 1992, in conjunction with the Wellhead Protection Advisory Committee meeting to take comments on the final version of the Montana Wellhead Protection Program that will be submitted to the EPA for approval. The hearing will start at 9:00 am in Room C-209 of the Cogswell Building, 1400 Broadway, Helena, MT.

Case Histories

Demonstration Projects--Communities. Two demonstration projects are underway to document the resources needed and the obstacles encountered in designing and managing a wellhead protection area in Montana. The Missoula project was funded cooperatively by Mountain Water Company, EPA, the Missoula City/County Health Department, and the Montana Water Quality Bureau. The Polson project was funded by a Renewable Resource Development Grant from the DNRC. Appendix A summarizes the programs in these Wellhead Protection Areas.

Missoula and Polson are very different communities in western Montana. Missoula has its drinking water supplied by a private company, Mountain Water Company, with 14,600 service connections for a population of 50,000 people. The groundwater is from an unconfined, alluvial aquifer with 34 wells ranging from 125 to 170 feet in depth, pumping 7 to 10 billion gallons of water annually. Most of the wellhead protection areas will be within the city limits.

Mountain Water Company has developed a media campaign including radio, television, newspaper, and billboard advertizing. They highlight the groundwater quality issues associated with the Missoula aquifer and suggest citizen action to address the issues. The Missoula

City/County Health Department has developed brochures, workshops, and media presentations to describe the management of the Missoula Aquifer. This material will be available for use by the statewide wellhead protection program.

The Missoula City/County Health Department prepared maps for identifying the location of sources of contaminants in relationship to the public water supply wells. They were later used to help select the wellhead protection areas. Mountain Water Company digitized the source location maps on a Computer Aided Drafting (CAD) system to enable later incorporation on a Geographic Information System (GIS). This mapping project will serve as a prototype for other communities that may use a GIS to map wellhead delineations in the future.

Mountain Water Company, in cooperation with the Missoula Chamber of Commerce and the University of Montana, is developing a self-regulatory program for businesses. Students, majoring in Business, will aid local businesses in evaluating their chemical use, storage, and disposal. Businesses who voluntarily comply with the best management practices developed in this cooperative effort will be given stickers for their doors designating them as businesses that actively participate in preserving Missoula's aquifer.

The town of Polson supplies its drinking water from a mix of surface and groundwater sources. There are 1,584 service connections for a population of 3,140 people. The groundwater source is from a semiconfined aquifer with all the wells deeper than 150 feet. In addition, Polson is an incorporated town within the boundaries of the Flathead Indian Reservation. The wellhead protection areas will extend beyond the city limits.

Demonstration Projects--Schools. The Water Quality Bureau is funding four schools to do demonstration projects on their own public water supply well. Arlee Schools, Desmet Elementary in Missoula, Augusta High School, Bonner Elementary are contracted to put together a wellhead protection plan and document the process for the use of other schools. The documentation will be available at the end of the 1992-93 school year.

Developing the wellhead protection plan is an interdisciplinary school project with the children doing the work under the guidance of the teachers. It is a valuable learning experience in science, math, social studies, composition, speech, and art. And, the end product is a real asset to the school and local community.

The schools have sources of help to draw on. Specific guidance and materials are available from EPA. There are curriculum aids developed to help teachers and children learn about the processes they should understand in order to develop a plan. The Water Quality Bureau's Wellhead Protection Specialist, the MBMG's Groundwater Specialists, and the Department of Public Instruction's Curriculum Specialists are available to help the school get started and address problems as they arise. Also, the MBMG is requesting a grant to help schools install personal computer software for GIS data input and display. In many communities, members of the community with special skills have volunteered to help.

Voluntary Projects. In the spirit of "individualism and independent action" that is a hallmark of Montana communities, the neighboring communities of Sheridan and Twin Bridges have initiated groundwater protection programs for their water supplies. In many ways, these two towns, which have populations around 500, are more representative of the average Montana community than either Polson or Missoula. The citizens themselves are addressing the need to protect their drinking water supplies with little outside financial aid or expertise.

Sheridan supplies its drinking water from a semiconfined aquifer in an alluvial fan. The aquifer is an indurated, conglomerate formation. The opportunities to develop a sufficient water supply in this setting are quite limited. The water supply has 359 service connections for a population of 570 people.

Twin Bridges taps a semiconfined alluvial valley aquifer which is highly transmissive. The water supply has 175 service connections for a population of 450 people.

Although the communities are less than 10 miles apart, their aquifers are quite different. The methods selected to protect their groundwater supplies are also quite different. Sheridan passed an ordinance to regulate establishments which are potential sources of contamination within a three mile radius of the city limits. Twin Bridges has opted to manage only the aquifer underlying their city limits.

The Wellhead Protection Specialist used the simplified variable shapes method and readily available hydrogeologic information to delineate a wellhead area superimposed on a GIS generated map. The time of travel criterion with a 365 day threshold delineation correlates well with the wellhead boundaries selected for management.

ROLES AND DUTIES OF STATE AND LOCAL GOVERNMENT

It is the position of the Montana Water Quality Bureau that the people who drink the water are the ones who should design and manage a wellhead protection area for this valuable groundwater resource. Therefore, the Montana Wellhead Protection Program will strive to empower local governments, water districts, schools, and homeowner associations with the authority and resources needed to attain this goal. A community may certify their wellhead protection area through the Water Quality Bureau. A certified wellhead protection area will be eligible to apply for either a use or susceptibility waiver of the monitoring requirements established by the EPA's Phase II and Phase V rules. Certification will be required to nominate lands within the wellhead protection area for the CRP.

State Roles

Pursuant to the requirements of the 1986 Amendments to the Safe Drinking Water Act, the Water Quality Bureau, Division of Environmental Sciences, DHES has been designated to implement the Montana Wellhead Protection Program. Appendix B contains the letter, signed in 1987 by Governor Ted Schwinden making the designation. The Water Quality Bureau will

coordinate the Montana Wellhead Protection Program with local governments, other state and federal agencies, Indian tribal governments, bordering states and Canada. This coordination is described in the section titled Management Approaches. The Environmental Sciences Division DHES will coordinate Emergency Plans as described in the section titled Development of Contingency Plans.

The Water Quality Bureau has six sections located in Helena and one branch office in Billings to cover the eastern half of the state. Of the six sections, four are key to implementing the Wellhead Protection Program.

1) The Permits/Groundwater Section has two programs. The Surface Water Program issues waste discharge permits, reviews plans for compliance with water quality standards, performs compliance investigation and monitoring, assures groundwater pollution control, issues permits for uranium solution mining, coordinates with the Department of State Lands to facilitate permitting of mineral processing operations and insuring compliance with applicable water regulations, and prosecutes water quality violations.

The Groundwater Program administers the Groundwater Pollution Control System regulations, establishes groundwater quality standards, enforces the nondegradation policy, issues permits, oversees the cleanup of spills, administers the Wellhead Protection Program and Local Water Quality Protection Districts, coordinates with the Montana Department of Agriculture (MDA) in implementing pesticides and groundwater management plans, assists the Board of Water Well Contractors which is administered by the DNRC, and coordinates with the MBMG and the NRIS of the State Library to characterize, classify, and compile data on Montana's aquifers.

In administering the Wellhead Protection Program, the Groundwater Section will set the standards for certifying the wellhead protection areas developed by local government entities. The staff will coordinate the Wellhead Protection Program with other government agencies, certify the wellhead protection areas, and organize the education program as described in the section titled Management Approaches. The staff will also provide technical assistance in delineating the wellhead protection areas as described in the section titled Delineation of Wellhead Protection Areas, and provide risk assessments on the vulnerability of aquifers to contamination as described in the section titled Inventory of Potential Contamination Sources.

2) The Drinking Water/Subdivision Section has two units. The Municipal Water Supply Unit reviews plans for public water and sewer systems, inspects public water and sewer systems, is the primacy agent for the Safe Drinking Water Act, monitors public water systems' water quality, trains and certifies water and wastewater operators, provides technical assistance to operators, assists owners of private wells, assists the Board of Plumbers, and performs Giardia and surface water source studies. The Subdivision Review Unit reviews subdivision applications and plans for water supplies, sewage disposal, solid waste disposal, and storm drainage. In addition, they assist and train local health departments and perform subdivision site inspections.

In administering the Wellhead Protection Program, the Drinking Water/Subdivision Section will take the lead in developing construction standards and reviewing plans for new public water supply wells. The Drinking Water Division will conduct the vulnerability assessments described in more detail in the section titled Inventory of Potential Contamination Sources and the education program described in the section titled Management Approaches. The Subdivisions Division will determine the status of sanitary restrictions for new developments in wellhead protection areas.

3) The Municipal Wastewater Assistance Section assists grant applicants; establish priorities; reviews plans; provides operator training, technical assistance and statewide training coordination; provides total administration of the Federal Construction Grant Program; administers the State Revolving Loan Program; and performs site inspections. This section coordinates the training activities of the Water School and the Montana Environmental Training Center. They also publish the *Big Sky Clearwater* which will be used to keep water supply operators informed of the wellhead protection program.

4) The Ecosystems Management Section administers the Nonpoint Source Pollution Control Program which conducts demonstration projects, develops best management practices, provides information and education, oversees forest practices, issues short-term exemptions for construction, certifies water quality standards (401), and monitors feedlots and wetlands. It also administers the Monitoring, Assessment, and Planning Program for fixed-station monitoring of the Clark Fork, intensive surveys, waterbody assessments and 305(b) reports, project planning for watershed and river basin studies, Clean Lakes (CWA Section 314), special projects such as reference streams, and quality assurance/quality control. This section publishes the *Water Column* with a portion of the document designated for wellhead protection news.

Statutes and rules administered by the Water Quality Bureau are listed in Table 1.

TABLE 1
LAWS AND REGULATIONS ADMINISTERED BY THE WATER QUALITY BUREAU

TITLE	LAW: MCA	RULE: ARM[4]
Agricultural Chemicals Groundwater Protection Act	80-15-101 to 414	4.11.101 to 1117
Local Water Quality Districts Act	7-13-4501 to 4529	
Phosphorus Detergent	75-7-401	
Water Quality Act	75-5-101 to 641	16.20.601-643
Public Water Supply	75-6-101 to 121	16.20.201-242
School Sites and Plans	20-6-603	

Sanitation in Subdivisions Act	76-4-101 to 1251	
Wastewater Treatment Revolving Fund Act	75-5-1101 to 1122	
Water and Wastewater Operators Certification	37-42-101 to 322	
Subdivision Application & Review		16.16.101-116
Environmental Policy Act	75-1-101 to 207	
Subdivision Requirements		16.16.301-313
Subdivision Waivers & Exclusions		16.16.601-699
Subdivision Review Fees		16.16.801-805
Water & Wastewater Operators Advisory Council		16.18.101-102
Water & Wastewater Plants and Operators		16.18.201-209
State Revolving Fund (SRF)		16.18.301-310
Procedural Rules		16.20.101-103
Water Hauled for Cisterns		16.20.301-307
Public Water & Sewer Plans, Cross Connections & Drilling Water Wells		16.20.401-405
Surface Water Quality Standards		16.20.601-643
Groundwater Quality Standards		16.20.920-926
Nondegradation of Water Quality		16.20.701-705
Montana Groundwater Pollution Control System		16.20.1001-1025
Montana In-Situ Mining of Uranium Control (MIMUCS) Permit		16.20.1101-1116
Prohibited Compounds		16.20.1201-1203
Montana Pollutant Discharge Elimination System (MPDES) Permit		16.20.1301-1347
Pretreatment		16.20.1401-1416
Miscellaneous		16.20.1601-1603

Other bureaus of the DHES that will be key participants in implementing the Wellhead Protection Program are the Solid and Hazardous Waste Bureau, the Food and Consumer Safety Bureau, and Epidemiology Section of the Preventative Health Services Bureau. Each of these bureaus will regulate activities in wellhead protection areas. They also compile information on contaminant sources.

The Solid and Hazardous Waste Bureau administers the remediation at some federal and all state superfund sites (MCA 75-10-601 to 724), regulates hazardous waste generation and disposal (MCA 75-10-101 to 451, ARM 16.44.101-1018), licenses solid waste disposal sites (MCA 75-10-901 to 1101, ARM 16.14.101-813), administers the Underground Storage Tank Leak Prevention and Corrective Action Program (MCA 75-11-201 to 321, ARM 16.44.101-103), administers Solid Waste Management Districts (MCA 7-13-201 to 243) and monitors impacts to the groundwater from these sources.

The Food and Consumer Safety Bureau registers county sanitarians (MCA 37-40-101 to 312) and septic tank cleaners (MCA 37-41-101 to 212, ARM 16.14.806-812, ARM 16.10.636-1108), and monitors those activities classified as public nuisances (MCA 27-30-101 to 302).

The Epidemiology Section of the Preventative Health Services Bureau provides surveillance and investigates the occurrence of water-borne disease outbreaks and recommends preventative action. They also investigate the health effects of toxic substances found in water (MCA 50-1-101).

Other state agencies that administer programs related to implementing a Wellhead Protection Program are:

MDA administers the Agriculture Chemicals Groundwater Protection Act (MCA 80-15-101 to 414, ARM 4.11.101-1117).

Attorney General's Office facilitates cooperative agreements between Montana and Tribal Governments, neighboring states, and Canada (MCA 18-11-101 to 111).

Department of Commerce administers grant funds for public works and assists local governments with economic and community development via the Coal Board (MCA 15-35-101 to 205, ARM 8.101.301-310), Local Government Assistance Division (ARM 8.1.101), Business Assistance Division: Certified Cities (MCA 15-33-101 to 106, 7-21-2101 to 4212, 30-16-101 to 204), Public Safety Division Office of Research and Information Service (MCA 50-78-101 to 402), and Science and Technology Alliance (MCA 90-3-101 to 522).

Environmental Quality Council, a research arm of the legislature, investigates environmental quality issues and recommends legislative action to address them (MCA 75-1-301 to 324, ARM 32.2.202).

Department of Highways, through the Preconstruction Bureau, addresses contamination sites at maintenance shops and highway right-of-way (MCA 60-4-101 to 409).

State Library, NRIS, manages data acquisition and dissemination for natural resource programs. They also maintain a GIS (MCA 90-15-301 to 304).

Local Government Education Advisory Council and Local Government Policy Council work to improve the effectiveness of local governments to address local issues.

Department of Military Affairs, Disaster and Emergency Services Division coordinates federal, state, and local services during emergencies (ARM 2.3.102).

Montana State University, Extension Service, Water Resources Research Center, and Local Government Center provide information and education to local communities.

MBMG coordinates evaluation of groundwater resources, data collection, and monitoring. This agency also will assist in delineation of wellhead protection areas.

DNRC coordinates the development of the State Water Plan (MCA 85-1-203), regulates groundwater quantity issues including water rights, and administers the Board of Water Well Contractors (MCA 37-43-101 to 402, ARM 36.21.101-810). This agency also may assist in delineation of wellhead protection areas where adequate groundwater quantity is at issue.

Office of Public Instruction encourages development of groundwater education through their curriculum development services and disseminates information through their audio-visual library.

Public Service Commission monitors private utilities and determines what program costs (such as pollution prevention) can be placed in the rate bases (MCA 69-1-101).

Department of Revenue, Natural Resource and Corporation Tax Division, administers taxation of companies which may be sources of groundwater contamination (MCA 15-38-101 to 203, MCA 15-35-101 to 205, MCA 15-36-101 to 122).

Department of State Lands (DSL) regulates mining activities, sand and gravel quarries, and reclamation (MCA 77-1-101 to 810).

In addition to the agencies, there are several boards that have rulemaking authority and advisory councils whose jurisdictions cover some aspect of groundwater management:

Board of Health and Environmental Sciences	MCA 2-15-2104
Board of Sanitarians	MCA 2-15-1861
Board of Plumbers	MCA 2-15-1875
Water Pollution Control Advisory Council	MCA 2-15-2107
Petroleum Tank Release Compensation Board	MCA 2-15-2108
Wetlands Protection Board	MCA 2-15-3405
Montana Agricultural Development Council	MCA 2-15-3015
County Land Advisory Board	MCA 7-8-2701 to 2709
Board of Natural Resources and Conservation	MCA 2-15-3302
Board of Water Well Contractors	MCA 2-15-3307
State Data Processing Advisory Council	MCA 2-17-502
Board of Oil and Gas Conservation	MCA 2-15-3303
Water and Wastewater Operators' Advisory Council	MCA 2-15-2105
Wellhead Protection Advisory Committee	
Nonpoint Source Task Force	
Groundwater Assessment Steering Committee	MCA 2-15-1523

Natural Resource Data System Advisory Committee	MCA 2-15-1514
Public Service Commission	MCA 2-15-2612
Fertilizer Advisory Committee	MCA 2-15-1516
Hard Rock Mining Impact Board	MCA 2-15-1822

To insure coordination between the various regulatory programs and the Wellhead Protection Program, memorandums of understanding (MOU) will be developed as a mechanism to formalize and coordinate responsibilities between agencies. Such a MOU would be needed between the Water Quality Bureau, the DNRC, and the MBMG to implement the Wellhead Protection Program. The MOU would include procedures for delineation of wellhead areas and the preparation of a Technical Guide for local communities that will list the requirements for certification of the wellhead protection area. The State Water Plan proposes a cooperative effort between the DHES and the DNRC to conduct a source inventory.

A MOU is currently in place between the DHES and the DSL. This MOU was developed to facilitate issuing permits for mineral processing operations and insure compliance with applicable water regulations. This MOU is currently being revised. A MOU is currently being developed between DHES and MDA to enhance implementation of responsibilities mandated under the Montana Agricultural Chemical Ground Water Protection Act. The MOU will provide protocols for notification of detection of agricultural chemicals, exchange of groundwater monitoring data, and joint sampling for agrichemicals.

An MOU is being updated between the Water Quality Bureau and the National Forest to implement the Water Quality Management Program. The update will include coordination to implement the Wellhead Protection Program and the administration of Local Water Quality Districts. A similar MOU will be developed with the Interior Department: Bureau of Land Management, Park Service, and Bureau of Reclamation.

Coordination between agencies is also facilitated by department heads via a Natural Resources Subcabinet. The directors of the natural resource management agencies meet every Monday to discuss program coordination and development. Another mechanism to enhance coordination is the practice of each natural resource agency to include members from program-related agencies on task forces and other committees.

Local Roles

Local government entities will initiate and coordinate the process of establishing a wellhead protection area; provide and administer the funding by applying for grants, assessing fees, etc.; and manage the wellhead protection area. The local entities that may establish a wellhead protection area for a public water supply within their jurisdictions are city or county governments (MCA 7-13-3001 to 4406), conservation districts (MCA 76-15-101 to 810), water districts (MCA 7-13-2201 to 2351), school administrations or boards (MCA 20-6-601 to 640), water user associations, homeowner associations, water conservancy districts (MCA 85-9-101 to 611), and local water quality protection districts (MCA 7-13-4501 to 4529).

Excerpts from a few of the pertinent laws give a clearer picture of local authority to pursue wellhead protection.

A person may not discharge sewage, drainage, industrial waste, or other wastes that will cause pollution of state waters used by a person for domestic use or as a source for a public water supply system or water or ice company. Such wastes may not be discharged into abandoned or operating water wells unless treated as prescribed by the Board of Health (MCA 75-6-112).

A city or town council has the power to prohibit any offensive and unwholesome establishments within the city or town or within 3 miles there of (MCA 7-21-4204).

In areas with documented contamination problems, a local water quality district may be formed to protect, preserve, and improve water quality. A board will govern the district. They will develop and implement a program in a carefully defined area, after their program is approved by the Water Quality Bureau (MCA 7-13-4501 to 4529).

Cities are granted control over the territory occupied by their public works and may abate nuisances and generally preserve the purity of its water supply (MCA 7-13-4406).

The trustees of any school district has the authority to select the site for school buildings and other school purposes. Any site must comply with the requirements prescribed by the DHES (MCA 20-6-621).

Water conservancy districts conserve and develop water resources for uses such as public water supplies. They may construct waterworks systems and facilities to control or correct pollution (MCA 85-9-104).

Soil conservation districts conserve soil resources to further the development and use of water to protect and promote public health, safety, and welfare (MCA 76-15-101).

Local fire chiefs may make onsite inspections of hazardous chemicals in the work place and report violations found to the county attorney or law enforcement (MCA 50-78-301).

A water district may act to prevent any interference with the waters that may endanger the inhabitants or lands of the district (MCA 7-13-2218).

County sanitarians, water and wastewater operators, elected officials, city/county health officials, fire marshals, county extension agents, city/county planners, and resource conservation and development officials are among those who will play important roles in establishing and managing wellhead protection areas. These individuals may organize or participate in the community planning team that will oversee the development of a wellhead protection area.

Private organizations such as the Montana Rural Water Systems, Northern Plains Resource Council, Alternative Energy Resource Organization, Montana Water Well Association, Montana Environmental Health Association, Montana Chapter of the American Water Resources Association, and the American Water Works Association hold training conferences or provide information and technical services concerning groundwater protection. Local members of these groups would be valuable participants in the community planning team. In addition, the community planning team may include members of service organizations, senior citizen groups, youth groups, and school personnel.

The team should select a leader, set goals and timetables, and serve as advisors to the government entity that will eventually manage the wellhead protection area. This team will coordinate with the state Water Quality Bureau and may hire private consultants in delineating the wellhead protection area, conducting the contaminant source inventory, designing contingency plans, recommending management approaches, and designating locations of new water supply wells.

The local government entity will manage the wellhead protection area. They will also submit the Protection Plan to the Water Quality Bureau if they wish to have their wellhead protection area certified under the state plan. Certification will be necessary to be eligible to apply for either a use or susceptibility waiver of the monitoring requirements established by the EPA's Phase II and Phase V rules. Certification will also be required to nominate lands within the wellhead protection area for the CRP.

State and Local Coordination

Coordination between state and local entities is an integral part of the Montana Wellhead Protection Program. The local government entities will interact with the Water Quality Bureau to secure technical assistance on wellhead delineation, grant writing, and risk assessment. They will coordinate with the Water Quality Bureau to provide training and educational materials such as videos, sand tanks, brochures, etc.

If a Water Quality Protection District is formed to manage the Wellhead Protection Area, the district will consult with the Water Quality Bureau in developing a program that will be effective in protecting, maintaining, and improving the quality of state water. The district program can not be implemented until a public hearing is held and the program is approved by the Board of Health and Environmental Sciences. The application will include a description of the area included in the district, identification of the water and land resources and sources of contamination, a list of water quality goals and proposed projects, and an analysis of potential adverse impacts to the environment.

The Water Quality Bureau will review and certify the local wellhead protection program. The Water Quality Bureau will coordinate with the existing state regulatory programs to assure clean up of contamination and monitoring of contaminant sources (see the section titled State Roles).

The purpose of the review and certification is to give priority to problems arising in wellhead protection areas.

The Water Quality Bureau will coordinate the statewide program with similar programs on tribal lands, in neighboring states, and Canada. The Water Quality Bureau is currently working with the Salish and Kootenai hydrogeologists, the city of Polson, and the Arlee Public Schools in developing wellhead protection areas on reservation lands. Jurisdictional questions will become a focus of discussion as soon as the wellhead areas are delineated.

The Water Quality Bureau's Ecosystems Program is coordinating their Clark Fork Basin Study in conjunction with the states of Idaho and Washington. In addition, the Spokane Water Quality Management Program in Washington and the Panhandle Health District in Idaho will coordinate with the Montana Wellhead Protection Program on issues affecting groundwater quality in the Clark Fork Basin.

The border with Canada in the northwestern corner of Montana has several areas of concern to both entities. Aquifers are shared and groundwater flow occurs in both a northerly and southerly direction at different locations along the border. Issues of mining and hydroelectric generation are of greatest concern. Coordination mechanisms will be required to resolve these issues.

The Water Quality Bureau will provide technical assistance to introduce legislation to give those served by a community water supply the authority to establish and manage a wellhead protection area. With the assistance of the MBMG, the DNRC, and the NRIS, the Water Quality Bureau will aid local groups in gathering scientific data on their aquifer and delineating a wellhead area that is both scientifically and legally defensible. The Water Quality Bureau will also suggest site specific strategies to effectively manage local wellhead areas.

In addition, an education program will a) provide training for local groups in establishing wellhead protection areas for their water supplies, b) distribute information describing current state regulatory programs and methods to create and manage a wellhead protection area, c) hold public meetings and use the news media to inform citizens on the issues addressed in a wellhead protection program, and d) inform local groups of funding sources and methods to apply for them. Appendix C includes the Public Awareness and Education Action Plan for 1991 through 1994.

The state agencies will provide risk assessments. The MBMG will evaluate Montana's aquifers to determine which are most vulnerable to contamination. The Water Quality Bureau will assess the public water supplies to determine which systems are most vulnerable to contamination. The Water Quality Bureau will evaluate sources of health threatening contaminants and determine where the substances are used and stored. The DNRC will evaluate areas to determine where groundwater supplies are fully allocated.

DELINEATION OF WELLHEAD PROTECTION AREAS

Available Technical Staff

Within the Water Quality Bureau's Groundwater Unit, are two and one/half positions to oversee groundwater protection programs. These staff members are hydrogeologists. One position is the Wellhead Protection Program Manager, another is the Agricultural Chemical Groundwater Protection Program Coordinator, and the half position is the Water Quality Protection District Program Manager. In the Water Quality Bureau's Billings Regional Office, a portion of an environmental engineer position will be allocated for wellhead protection technical assistance. The staff will expand to meet demand for services as water quality protection districts, wellhead protection areas, and pesticide management areas are created.

If requests for technical assistance exceed the ability of the Water Quality Bureau staff to respond in a timely manner, the Hydrology Section of the MBMG has five hydrogeologists and one civil engineer who may assist in wellhead delineation. In addition, the Water Management Bureau of the DNRC has two hydrogeologists who may assist in wellhead delineations. The implementation of the Montana Water Plan after adoption by the 1993 Legislature will result in an MOU that will address coordination of groundwater quality/quantity activities. Delineation of wellhead protection areas will be address in this document. The MOU is scheduled for completion by December, 1992.

Criteria

The term "criteria" is used in this program description to group all conceptual standards which form the technical basis for wellhead protection delineation. Appendix H is an excerpt of the Missoula Wellhead Protection Plan[5] that describes the delineation process and criteria selection. The following delineation criteria were selected in consultation with hydrogeologists from the MBMG and the DNRC and environmental engineers from the Water Quality Bureau, Public Water Supply program and the EPA Regional Office.

Wellhead protection in Montana will address aquifers tapped by wells, infiltration galleries, radial collection wells, and springs that serve public drinking water supplies. Montana's public water supplies from groundwater sources will be separated into three groups. Group 1 will be noncommunity public water supplies serving a population of 25 or more people. Group 2 will be public water supplies having 10 to 4,999 service connections. Group 3 will be public water supplies having 5,000 or more service connections. The criteria used and the management techniques selected will be more comprehensive in Group 3 than in Group 1.

Over 75% of Montana's public water supplies obtain groundwater from Quaternary alluvial aquifers. The following criteria will be used to approve a local wellhead protection area in alluvial aquifers.

Group 1 may use the distance criterion to delineate a wellhead protection area with a threshold value of at least a 100-foot radius around the wellhead. At well sites found to be vulnerable to contamination by a vulnerability assessment described in Appendix D, a wellfield management zone must extend at least 2,500 feet around the wellhead. The arbitrary fixed radius method may be used. This group may opt to use any other method of delineation to define their wellhead protection area more scientifically (See Appendix H).

Group 2 may use the distance criterion to delineate the protection zone nearest to the wellhead with a threshold value of at least a 100-foot radius around the wellhead. A wellfield management zone should be delineated using either the flow boundaries criterion with threshold values of both physical and hydrologic boundaries or the time of travel criterion with a threshold value of at least 100 days time of travel. The simplified variable shapes or hydrogeologic mapping method may be used. The wellhead protection area will then describe the zone of contribution to the well. This group may opt to use any other method of delineation to define their wellhead protection area more scientifically (See Appendix H).

Group 3 may use the distance criterion to delineate the protection zone nearest to the wellhead with a threshold value of at least a 100-foot radius around the wellhead. A wellfield management zone should be delineated using the flow boundaries criterion with threshold values of both physical and hydrologic boundaries or the time of travel criterion with a threshold value of at least 100 days time of travel. The simplified variable shapes or hydrogeologic mapping method may be used. If a specific contaminant is known to threaten a public water supply, an attenuation zone should be considered using an analytical method. The assimilative capacity criterion should be used with a threshold value at least equivalent to the appropriate water quality standard for the contaminant. This group may opt to use any other method of delineation to define their wellhead protection area more scientifically (See Appendix H).

Rationale for Wellhead Protection Delineation Methods

Montana has opted to adopt the wellfield management goal because of the nature of the state's alluvial valley aquifers which supply most of the public water supplies. Montana is in the enviable position of protecting near pristine groundwater supplies. Therefore the concept of remedial action or contaminant attenuation zones are not appropriate in most cases. The program will advocate a multiple zone management concept with the most stringent management closest to the wellhead. For instance, drinking water regulations will require community water supplies to control a 100-foot radius around the wellhead by ownership, zoning, easements, lease, or other means.

If the wellhead protection area is a delineation of a fractured bedrock aquifer or a confined aquifer with a potentiometric surface that remains above the top of the aquifer during pumping, the recharge area should be defined using the flow boundaries criterion. In both of these cases, the recharge area would receive more intense management than the zone nearest the wellhead.

The EPA has suggested a matrix to aid in selection of appropriate criteria. The matrix ranks the criteria against policy and technical considerations[6]. The criteria ranking results for Montana aquifers are: distance (5), flow boundaries (4), time of travel (3), drawdown (2), assimilative capacity (1). The number 5 represents the criterion most appropriate to the conditions found in the state.

A distance criterion is currently being incorporated into Water Quality Bureau rules to specify construction standards for public water supplies. It is based on the *Recommended Standards for Water Works*[7]. For new public water supply wells, the rules will recommend a 2,500-foot radius around each wellhead which will be inventoried for possible sources of contamination by the project engineer preparing the site plan. Within that area, the regulations will require that the well owners control a 100-foot radius around the wellhead by ownership, zoning, easements, lease, or other means.

The Public Water Supply Section of the Water Quality Bureau is nearing completion of the vulnerability assessments for volatile organic chemicals. Appendix D contains the forms used in the assessments. Vulnerability assessments for soluble organic compounds began in the spring of 1992. It will take three years to complete. The areas with the greatest contamination threat will be evaluated in the first year. The remainder will be evaluated in 1993 and 1994. As the assessments are done, the inspectors will stress the advantages of wellhead protection and supply the operators with information on how to get started.

A time of travel criteria of 100 days corresponds with the time to ensure the natural or appreciable reduction in microbial organisms and enteric viruses in a highly permeable, unconfined aquifer, recharged by local precipitation and waterways[8]. Given the relatively fast flowing alluvial aquifers which can range between 3 to 30 feet per day[9], this minimum threshold, although very low, should provide protection to an area 300 to 3,000 feet from the well. The data required to delineate a variable shape wellhead protection area is available from well logs, aquifer test information, regional data bases, and other sources[10].

The narrow alluvial valleys of Montana contain most of the public water supplies. These valleys often contain recharge boundaries and are of limited aerial extent, usually less than two miles wide. Therefore, the flow boundaries criterion can best define the wellhead area. The time of travel criterion with a threshold travel time in years may delineate a boundary miles away from the well; but, in reality, a flow boundary will likely be encountered in a shorter distance. In most alluvial aquifers in Montana, a flow boundary will be reached within a travel time of 90 days to 5 years. The median time of travel to reach a boundary would be measured in days rather than years.

In bedrock or confined aquifers, which comprise less than 25% of the municipal water supplies[11], the time of travel criterion and 100-day threshold value would not be appropriate. Therefore, flow boundaries, defining a recharge area, is the preferred criterion to delineate the wellhead protection area. Using flow boundaries to define a wellhead protection area in these cases, will usually define a large area a great distance from the well or spring. In many cases,

recharge areas will lie on federal lands. Therefore, close cooperation between federal land management agencies and local communities will be essential in managing the wellhead area.

Delineation approaches for wells that intersect multiple aquifers are not specified because ARM 36.21.650 does not permit casing perforations that allow the well casing to act as a conduit for deleterious interflow between aquifers. An aquifer is defined as any discrete water bearing unit with a specific water chemistry, temperature, or hydrostatic head (ARM 36.21.634).

Based on public comment on the initial policy direction issued by the Wellhead Protection Advisory Committee, the committee decided to drop the concept of phasing in delineation of wellhead areas. In a voluntary program, communities may elect to redelineate the wellhead protection areas as new information becomes available and as economic factors allow. (See the section titled Public Comments on Draft Policy Statement of the Wellhead Protection Advisory Committee).

INVENTORY OF POTENTIAL CONTAMINATION SOURCES

Sources of Information on Groundwater Contaminants

The major contaminant sources that threaten Montana's groundwater are Class V injection wells and storm water drains[12]. These are sources of organic contaminants. These wells are concentrated in urban areas. The Montana EPA office estimates that Montana has about 10,000 dry wells for storm drainage, 400 industrial injection wells, and 500 automotive injection wells. About 150 of the automotive injection wells have been closed.

Approximately 120,000 individual, on-site septic systems are used by 300,000 people in Montana. Officials have not adequately documented the impacts of these systems on groundwater quality but septic system failures are suspected to cause substantial, widespread coliform and nutrient contamination to groundwater. Where septic system failures are documented, the Legislature has authorized the DHES to issue cleanup orders to local governments. Other legislation requires Local Boards of Health to regulate septic and sewer systems.

As of May 1991, Montana had registered 22,482 underground storage tanks. The majority of tanks were installed 10 to 20 years ago. Most tanks were on residential, commercial, or farm property. All new underground tanks must be fitted with leak detection systems. There have been 500 confirmed releases from underground tanks and new reports come in at a rate of 20 to 30 per month. Fewer than half of the releases have reached groundwater. Of these, only a few releases have affected a drinking water supply. The Water Quality Bureau is in the process of issuing groundwater permits to five land farm sites to handle treatment and disposal of contaminated soils from leaking petroleum tanks.

Montana has eight sites listed on the federal Superfund National Priority List. As of October 1991, there were 236 sites prioritized for remedial action through the Montana Comprehensive

Environmental Cleanup and Responsibility Act (CECRA). Unlike the federal Superfund Act, this act also addresses sites that have asbestos or petroleum contamination. Fifty-nine of these sites have documented impacts to groundwater.

Montana currently has 416 generators and recyclers of hazardous wastes. About 40 hazardous waste transporters are registered with the Solid and Hazardous Waste Bureau. Many smaller businesses handle hazardous materials but are not required to register. There are currently 11 permitted facilities that treat, store, or dispose of hazardous waste.

An average of 300 incidents are reported each year to the Hazardous Materials Emergency Response System. Of these incidents, about 5% will require extensive cleanup and monitoring.

Seven pesticides have been detected in Montana groundwater. These include the herbicides atrazine, 2,4-D, dicamba, MCPA, picloram, simazine and the insecticide aldicarb. All the detection levels were below established health guidance levels. The Montana Agricultural Chemical Groundwater Protection Act directs the MDA and DHES to develop specific management plans implementing best management practices (BMPs) for such sites.

The Department of State Lands have reported that between two-thirds and three-fourths of the mines that have used cyanide to process ore in Montana have had documented fluid losses. There are about 30 ore processors that use cyanide, 14 of which are inactive at this time. Of the releases, four were of a magnitude to affect groundwater quality beyond the boundaries of the mine property. Two resulted in the contamination of nearby domestic wells.

The American Petroleum Institute estimated that for the 623 wells drilled in 1985, 4.5 million barrels of drilling fluids were produced. An average of 7,330 barrels per well. This fluid can contain benzene, phenanthrene, barium, fluoride, antimony, along with high concentrations of calcium, magnesium, sodium, chloride, and sulfate. The salts can easily migrate with soil water into the groundwater. There are documented cases where these wastes have contaminated domestic water supplies in eastern Montana. Contaminated groundwater has also been detected entering streams and drainage ditches. The extent of the problem is unknown.

Landfills are a source of groundwater contamination in Montana. Twenty-five years ago there were about 500 in the state. In 1987, there were 140 landfills operating and only a dozen had begun groundwater monitoring. In response to Subtitle D of the 1976 Resource Conservation and Recovery Act, the EPA has proposed regulations requiring groundwater monitoring on an ongoing basis for thirty years after closure of a landfill. In 1989, the Legislature required site plan review for new landfills and expanded groundwater monitoring. Many small landfills are closing. After Subtitle D regulations are adopted, the DHES estimates there will be only 35 to 50 regional landfills operating in the state.

To address the problems associated with these closures, the Montana Legislature passed the Montana Integrated Waste Management Act and the Class E Motor Carrier Authority for the Transportation of Recyclables. These programs will be voluntary and stress source reduction,

reuse, recycling, composting, and incineration. The goal is to reduce the volume of the state's solid waste by 25% by 1996. The state agencies have a goal of recycling 95% of the paper used by 1996. Specific wastes receive special management: infectious wastes, household hazardous waste, and motor oil recycling.

To address importation of waste, the Legislature passed the Solid Waste Management Fee on Waste Generated Out-of-State, an extension of the Moratorium on Interstate Transport of Solid Waste, and a Mega-landfill Siting Act. The Legislature also expanded the Solid Waste Bureau and established a fee system to fund the program in the Solid Waste Management System Application and License Fee.

For the most part, groundwater in Montana has not been degraded by human-caused contamination. However, natural substances have affected the water quality of many aquifers. Examples of these are arsenic, nitrates, and total dissolved solids.

Table 2 is a list of sources that have the greatest potential to pollute a groundwater supply in Montana. The categories in this list were developed for the Texas Wellhead Protection Program[13]. Sources were included based on relative risk to groundwater, contaminant information contained in agency databases, and a contaminant source evaluation and inventory done for the Missoula Wellhead Protection Area[14]

TABLE 2
POTENTIAL SOURCES OF GROUNDWATER CONTAMINANTS

Location of Potential Contaminant	Specific Site
Land Surface	Hazardous material generators Spills Fertilizer and pesticide use areas, mixing and loading zones Irrigated lawns and crops Brine pits Land disposal of solid or liquid waste Illegal dumps Facilities using or storing chemicals Land farms for sludge, sewage, or petroleum contaminated soil Deicing salt usage or storage Animal feedlots Holding ponds and lagoons Accumulation of airborne particulates Transportation routes, pipelines, and terminals

Soil Above the Water Table	Sumps and dry wells Storm water sumps and ponds Septic tanks, cesspools and privies Underground storage tanks and pipelines Sanitary landfills Sewer lines and lift stations Artificial recharge projects
Below the Water Table	Class II Injection wells Mine shafts Oil and gas wells Secondary recovery operations Chemigation wells Drainage canals Sites with groundwater permits Abandoned wells

The three broad categories used to define the sources of contamination were developed to help those performing the inventories to include sources below the ground and below the water table as well as on the surface. It also helps set priorities for management. Sources of contamination above the ground will be most important in the zone closest to the well. Sources of contamination below the water table will be most important in the zone above a confining layer for an aquifer.

Specific state programs regulate specific categories of contaminants, such as the Underground Storage Tank Program, Agrichemicals in Groundwater Program, or Hazardous Waste Program. All establishments that annually use 20 gallons or more of halogenated solvents must register with the DHES (MCA 75-10-451). To date, 202 businesses have registered. Each agency implements its own inventory of sources. With GIS mapping systems, these various inventories will be combined and displayed for easier information access and management in the future.

The Public Water Supply Section will begin vulnerability assessments for volatile organic chemicals in the spring of 1992. Appendix D contains the forms used in the assessments. They will divide the water supply data base into three groups. The areas with the greatest contamination threat will be evaluated in the first year. The remainder will be evaluated in 1993 and 1994. As the assessments are done, the inspectors will stress the advantages of wellhead protection and supply the operators with information on how to get started.

The Department of Commerce encourages each municipality in Montana to become a "Certified City". In order to achieve this designation, the municipality must survey all local businesses to determine where they are located and what products or services are produced. Under MCA 50-78-301, fire marshals conduct inspections of local businesses to determine what types of chemicals are used and stored at each business site.

Inventory Procedures

After local wellhead protection areas are delineated, the local entity will conduct a field inventory of potential contaminant sources. Appendix E shows a sample of the inventory form. The inventory will include potential anthropogenic sources of contaminants which could have an adverse effect on human health and are located within the wellhead area. The agencies and resources listed in the previous section will be helpful in starting the inventory of potential contaminant sources.

The inventories may be completed by volunteers from the community, local government employees, or private consultants. The Water Quality Bureau will offer training for volunteers and local government employees. The most valuable volunteers would be senior citizens who have observed the development of their community over a number of years. They are a source of information that can be found no where else. Students in college business programs or service groups such as Scouts and 4H would also be valuable volunteers.

Potential contaminant sources should be accurately located on a map of the community showing the wellhead protection area boundaries. Each source should be identified by a number that links the map location to the information on the source in the inventory. Information on the source should include:

A unique identification number
Address of the site or latitude/longitude or township/range/section
The landowners name, address, and phone number
Name, address, and phone number of any renters or lease holders
Type of activity
Chemicals used or stored

For communities that wish to have their wellhead protection area certified by the Montana Water Quality Bureau, copies of the inventories and maps should be sent to the Water Quality Bureau to be entered on a statewide data base of potential contaminant sources. The possible sources of contamination and the delineated wellhead protection zones will be digitized on a statewide GIS mapping system.

Updating and Refining the Inventories

For certified wellhead protection areas, the inventory of each wellhead protection area should be updated at least every five years and submitted to the Water Quality Bureau. Water Quality Bureau personnel will verify inventory information during surveys completed for new well construction. The information will be used to update the statewide GIS mapping system.

MANAGEMENT APPROACHES

Statewide Management Program

Gauging Success. The Advisory Committee for the Montana Wellhead Protection Program has recommended the following method for gaging the success of a voluntary program. The risk assessment being performed by the Drinking Water section will pinpoint problem supplies. A successful program will protect all vulnerable systems within 10 years. Systems that are not vulnerable to contamination may not need wellhead protection.

A successful program will develop incentives and clearly communicate them to encourage participation. Businesses will be involved, preferably in a self-regulating program that reduces the need for regulatory management of the wellhead areas. A technical guide will be available and provide guidelines for communities. The state will review and certify wellhead protection areas. The information and education program will reach communities statewide. Information will be compiled in databases that are easily accessible to the public.

After the program has been running five years, a survey should go out to determine why systems have not elected to start wellhead protection. The results of the survey will identify obstacles and suggest ways to remove them. If the voluntary program has not meet these goals in 10 years, a regulatory program can be instituted by legislation.

Coordination with Regulatory and Nonregulatory Programs. The primary focus of most of the state's water quality programs have been regulation of a particular point source or type of pollutant. These programs are listed in the State Roles section of this document and detailed in Montana/EPA documents[15]. For the most part these are reactive programs addressing problems as they are discovered. The Water Quality Bureau will coordinate with the existing state regulatory programs to assure clean up of contamination and monitoring of contaminant sources within wellhead areas. The section titled Sources of Information on Groundwater Contaminants lists many of the management systems already in place to control contaminant sources.

Adequate protection of public water supplies should include control measures in the recharge area. Nonpoint source control[16], watershed management plans[17], and storm water runoff management programs, developed by the Water Quality Bureau, will enhance management of recharge areas. These programs rely on BMPs, monitoring, discharge permits, and conservation easements. In addition, the surface water classifications established in ARM 16.20.604 to 612 declare certain drainages "A-Closed" to protect public health. Activities in these drainages are restricted as specified in ARM 16.20.616.

Design and operation standards and site plan review have been incorporated into many state programs. A few examples are: Public Water Supply Program reviewing well construction and design for public supplies, Board of Water Well Contractors reviewing monitoring well construction and design, Facility Siting Bureau reviewing siting and design of major energy

facilities, Municipal Waste Water Assistance Program reviewing design and operation of wastewater systems, and Solid Waste Programs reviewing design and operation of landfills.

The Agricultural Chemicals in Groundwater Act directs the MDA and the Water Quality Bureau to design site specific management plans in any area that is vulnerable to contamination from agrichemicals. BMPs will be developed to protect against groundwater contamination.

Coordination with Federal Land Management Agencies, Tribal Governments, Other States, and Canada. Federal lands are managed by the U.S. Department of Agriculture: Forest Service and the U.S. Department of Interior: Bureau of Land Management, Bureau of Reclamation, and Park Service. The recharge area of many community public water supplies will be under the jurisdiction of these federal agencies. In addition, many noncommunity public water supplies are operated by these agencies at campgrounds and other facilities. The Water Quality Bureau will coordinate with these agencies to provide wellhead protection areas for their water supplies and to revise their management plans to facilitate effective management of the recharge areas of community water supply wells.

The Water Quality Bureau will coordinate the Montana Wellhead Protection Program with similar programs developed by the six tribal governments whose reservations lie within Montana's borders: Crow, Northern Cheyenne, Confederated Salish/Kootenai, Blackfeet, Chippewa/Cree, Ft. Belknap, and Ft. Peck Tribes: Assiniboine & Sioux. The Montana program will also coordinate closely with the wellhead protection programs developed in North Dakota, South Dakota, Wyoming, and Idaho.

Montana both provides the recharge area for some of Canada's aquifers and some of Montana's aquifers are recharged in Canada. Therefore, the Montana program will coordinate with similar programs developed by the Canadian government.

Education. Education and information distribution will be the main activity of the Water Quality Bureau in implementing the Montana Wellhead Protection Program. Appendix C contains the Public Awareness and Education Action Plan for 1991 to 1994. The Water Quality Bureau in conjunction with the Montana Environmental Training Center (METC) will provide training in water quality issues and management of sources of contamination. Classes will be held around the state and provide continuing education credits for recertification of water and wastewater plant operators. In addition, each year the Water Quality Bureau will hold a week-long Water School in Bozeman. Wellhead protection will be included as a half day session in METC classes and the Water School.

The wellhead protection curriculum developed by the school demonstration projects will be used to encourage other schools to initiate wellhead protection for their school well. Children who have been active in designing a wellhead protection area will be designated "Student Trainers". They will visit other schools to describe their experiences and answer questions about starting a wellhead protection project.

A training program will target community volunteers and local government employees who will conduct the contaminant source inventories. This training will be patterned after the successful program set up by the Texas Wellhead Protection Program.

The Water Quality Bureau and the MBMG will prepare a technical guide for local communities that will list the requirements for certification of the wellhead protection area by the Water Quality Bureau. This guide will be used in training sessions for community planning teams. The training will also demonstrate GIS use on a personal computer and how that can be translated to the statewide databases. The training will also demonstrate the use of a modem to access information compiled by state agencies.

The Montana Wellhead Protection Program will join with other state agencies, local groups and businesses in promoting waste reduction programs as outlined in the Montana Integrated Waste Management Act (MCA 75-10-801 to 807). The Solid and Hazardous Waste Bureau will prepare a comprehensive plan that will include an education and public information component to increase awareness and cooperation in environmentally safe waste management. The plan will also identify special disposal problems created by household wastes and recommend methods for reduction, collection, transportation, and disposal.

The Water Quality Bureau has a portable display that will be used to publicize the wellhead protection program at meetings and other gatherings. The following Montana groups have annual meetings and newsletters where wellhead protection information may be publicized:

County Disaster and Emergency Coordinators
Economic Development Councils
City and County Planning Boards
Water Supply Operators
ASUM Student Action Center
Alternative Energy Resource Organization
Clark Fork Coalition
Flathead Resources Organization
Property Owners Associations
Montana Association of Conservation Districts
Montana Association of Realtors
Montana Wilderness Association
Montana Riparian Association
Montana Taxpayers Association
Montana Solid Waste Contractors
Montana Environmental Health Association
Montana Chamber of Commerce
Montana League of Cities and Towns
Montana Water Course
Montana Education Association
Montana Water Resources Association
County Extension Service
Local Development Corporations
Waste Water Treatment Operators
County Weed Boards
Alliance for Public Policy
Cabinet Resource Group
Community Resource Center
Greater Yellowstone Coalition
League of Women Voters
Montana Association of Counties
Montana Audubon Society
Montana Municipal Insurance Authority
Montana Rural Water Systems, Inc.
Montana Salinity Control Association
Montana Senior Citizens Association
Montana Public Health Association
Montana Environmental Information Center
Montana Community Finance Corporation
Montana Law Center
Montana Section AWWA
Nature Conservancy

National Wildlife Federation
Northern Rocky Mountain Action Group
Old West Regional Commission
Retired Senior Volunteer Program
Voluntary Action Center
Women Involved in Farm Economics
Community Action Association
Senior Citizen Project Fund
Montana Environmental Education Association
Montana Association of Planners
Northern Plains Resource Council
Northwest Montana Resource Council
Project Wet
Rocky Mountain Developmental Council
Western Environmental Trade Association
Big Sky Council
Junior Chamber of Commerce
Local Government Center
Western Planner, Inc.

In addition, the Water Quality Bureau publishes a newsletter called *The Water Column*[18] and a magazine called the *Big Sky Clearwater*[19]. These acquaint people with the new programs and initiatives of the Water Quality Bureau. Wellhead protection articles have appeared in each issue beginning in the summer of 1991.

Local Wellhead Management

Local entities may choose to manage their wellhead protection areas in a variety of ways. The choice of management techniques will be determined by the size and nature of the wellhead protection area, and the type of local government entity. Management options are:

Source prohibitions and permits
Design standards
Best management practices
Local water quality district
Public education
Subdivision regulation
Sole source aquifer designation
Municipal ordinances
Operating standards
Purchase of property and development rights
Groundwater monitoring
Zoning ordinance
Site plan review
Inspectors at construction/drilling site

Table 3 lists the laws and regulations that may be useful in managing potential sources of contamination at the local level.

TABLE 3
REGULATING POLLUTION SOURCES

LEGISLATION	ACTION
MCA 75-5-103	Defines pollution
MCA 75-10-403	Defines sewage effluent, petroleum products, hazardous waste, pesticides, and fertilizers
MCA 75-10-701	Defines hazardous and deleterious substances
MCA 75-10-403	Defines regulated substances

MCA 75-10-451	Defines halogenated solvents
MCA 50-78-102	Defines hazardous chemicals
42 USC 300f	Contaminants identified that affecting water quality
MCA 75-10-602	Defines hazardous substances
ARM 36.21.601 to 680	Construction standards for water wells
ARM 36.21.801 to 810	Construction standards for monitoring wells
ARM 16.45.403	Requires leak detection equipment for underground storage tanks and lines
42 USC 300f, 300h-3(e)	Describes designation of a Sole Source Aquifer
40 CFR 302	Lists known hazardous and toxic properties
40 CFR 122.21	Lists toxic pollutants
MCA 7-13-4501 to 4529	Describes creation and operation of Local Water Quality Districts
MCA 7-21-4204	Defines offensive and unwholesome establishments
MCA 7-4-4306	Authorizes a municipality to regulate activities within a city limits and within five miles of its limits
MCA 7-13-4406	Authorizes a municipality to regulate or prohibit unwholesome activities within the municipality or within three miles of its limits.

In order to certify the wellhead protection area with the Water Quality Bureau, the managing government entity should set goals and time frames for gauging the success of their protection efforts. The community should develop a management plan to assure the site and groundwater does not become contaminated.

Examples of management styles are provided by Sheridan and Missoula. The town of Sheridan developed an ordinance to oversee, via permits, potential sources of contaminants. Sheridan used existing city structure and state regulations to implement the ordinance. Mountain Water Company, in Missoula, developed a draft city ordinance to prohibit or regulate hazardous and toxic substances within their wellhead protection areas. The ordinance will likely be administered by the Missoula City/County Health Department through a Local Water Quality District. Appendix F contains examples of these groundwater protection ordinances.

Identification of Uncontrolled Sources and the Rationale for Selecting Strategies for These Sources

Uncontrolled sources of contamination are identified and prioritized for control by the process of revising the State Water Plan. The Groundwater Quality\Quantity Management Steering Committee, coordinated by the DNRC, assists in the development of the State Water Plan. Prior to this year, the plan has focused on surface water quality/quantity issues and groundwater quantity issues. This year there is a section for groundwater quality/ quantity issues. The committee's report and recommendations are available for public review. The final plan will be used by the Legislature in 1993 to enact new legislation.

This committee has identified and analyzed the problems caused by uncontrolled sources of groundwater contamination. Issues identified were: 1) There is a need for notification of the public and other agencies when contamination is detected. 2) Clean up standards need to be established and discrepancies between standards for different uses such as drinking, fish, and wildlife need to be addressed. 3) Septic system installers should be certified. 4) The loophole of "temporary abandonment" of a well needs to be closed. 4) Oil and gas wells should be drilled so as to minimize cross contamination of aquifers. 5) Comprehensive water management plans should be required of mining activities and bonds should be increased to clean up degraded water. 6) Underground fluid injections need to be better monitored and regulated. 7) Legislation is needed to address abandoned intrastate pipelines. 8) Nonpoint sources should no longer be exempt from the nondegradation policy. 9) More information is needed on abandoned oil and gas wells. 10) Exploration data confidentiality inhibits flow of information about contaminant threats to water supplies.

In the development of the State Water Plan, these issues prioritized, combined, and sometimes dropped. Public input plays a significant role in this process. For those issues deemed most critical, strategies will be devised to propose legislation and implement source control. Appendix G contains the committee's recommendations, implementation plan, and target dates.

DEVELOPMENT OF CONTINGENCY PLANS

Existing Contingency Plans

The Department of Military Affairs, Disaster and Emergency Services Division and the DHES coordinates federal, state, and local services during emergencies (MCA 10-3-101 to 1115). Local disaster and emergency services also exist on the county level. Among their assigned functions is the mandate to protect public health during natural or human-caused disasters or emergencies. In addition, they are charged with promoting disaster prevention, planning, training, public education, and development of a comprehensive disaster and emergency plan[20]. The local disaster and emergency services also maintain a survey of industries, resources, and facilities within the state.

Coordination Mechanisms

The Department of Military Affairs, in cooperation with the DHES, Department of Transportation, MDA, Department of Justice, and Fish, Wildlife and Parks maintains a comprehensive plan that is coordinated with federal, state, local, and Canadian disaster and emergency services[21]. This plan meets the requirements of the Superfund Amendments and Reauthorization Act, Title III for contingency planning. In addition, Montana has joined with other states in an Interstate Mutual Aid Compact.

The state coordinates the activities of local disaster and emergency services when the emergency crosses jurisdictional boundaries or when backup help is required. The state incorporates an "Incident Command" approach to manage emergencies. Local, state, and federal personnel are trained to join or withdraw from the incident command structure for an effective response to the developing emergency. This process enhances efficient use of personnel and equipment.

The Montana Disaster and Emergency Plan covers four phases. 1) Predisaster phase includes plans for warning and communication, state emergency operation center, public information, and evacuation. 2) Disaster phase includes plans for search and rescue, health and medical services, law enforcement, transportation, fire suppression, and military support. 3) Recovery phase includes plans for disaster field office, state disaster assistance programs, damage assessment and damage survey, social services, housing and shelter, debris removal, crisis counseling, private and voluntary relief organizations, and mortuary services. 4) Hazard mitigation includes nondiscrimination, disaster assistance center, repair and restoration, debris removal, temporary housing, unemployment assistance, individual and family grant program, food and commodities distribution, legal services, crisis counseling, community disaster loans, temporary communications and public transportation, fire suppression, timber removal, and federal assistance.

Short-term Emergency Response

The Water Quality Bureau, in conjunction with the Department of Military Affairs, maintains a Hazardous Materials Emergency Response System. The phone number is 444-6911 and is staffed 24 hours a day. All spills or releases of hazardous materials or other wastes, regardless of size, that pollute or threaten to pollute state waters must be reported, contained, removed and disposed of to protect water quality. The Water Quality Bureau responds immediately to large spills of soluble toxic materials near a public supply well. Local health officials or police are notified and asked to investigate. Appropriate state agencies are notified. A Water Quality Bureau investigator is sent to the site. The responsible party is liable for clean up and monitoring.

Long-term Response

Long-term response usually involves testing the public water supply, boiling water or use of filtering devices, disinfecting the water system or other appropriate clean-up measures, and providing a community with potable water if their water supply can not be effectively decontaminated. Where new water supply wells are required, the new sources would be developed according to the regulations discussed in the New Well section of this document.

Long-term response includes monitoring to determine if residual contaminants exist and whether or not they are migrating in the vadose zone or groundwater. Treatment facilities would be installed to return the water to nondegradation standards. Monitoring plans are submitted to the Water Quality Bureau for approval and monitoring data submitted on a regular basis. Disposal sites are monitored by the responsible party if not a part of a licensed facility. Such sites are usually land farms for petroleum products.

NEW WELLS

Construction standards for new wells are currently being revised and incorporated into rules. The proposed revisions for large public water systems are contained in Circular WQB #1 and, for small public water systems, Circular WQB #3. These revisions are presently undergoing a public review period before they are adopted by the Board of Health and Environmental Sciences. The target date for completing this rule change in June, 1992.

For new public water supply wells, the rules require the submission of plans and specifications to the Water Quality Bureau prior to construction. The reviewing authority shall be consulted on proposed well location as it relates to required separation between existing and potential sources of contamination. The rules will recommend a 2,500-foot radius around each wellhead to be inventoried for possible sources of contamination by the project engineer preparing the site plan. Within that area, the regulations will require that the well owners control a 100-foot radius around the wellhead by ownership, zoning, easements, lease, or other means.

Each public water supply, not currently grandfathered from the proposed revisions, must have two sources of water supply. One acts as a back up when the other is down for maintenance or repair.

Before anyone can drill a new well that will yield more than 35 gallons per minute, the owner must obtain a permit to appropriate water from the DNRC[22]. The process begins with the owner filing an application for beneficial use and submitting a filing fee. In order to receive a permit, six criteria must be meet: 1) Unappropriated water is available. 2) No other water rights will be adversely affected. 3) The proposed well construction and operation are adequate. 4) The water will be put to beneficial use. 5) The proposed use will not adversely affect the water quality required for other beneficial uses of water right holders. 6) The well owner owns the land where the well will be drilled, or has the permission of the land owner.

In order to certify a wellhead protection area with the Water Quality Bureau, alternative locations for new wells should be sought. The area within a 2,500-foot radius of each location should be inventoried for potential sources of contamination. The community should develop a management plan to assure the site and groundwater does not become contaminated. If the community owns or controls the site, they should prohibit new sources of potential contamination being placed near the site. The community should seek a water right reservation from DNRC.

PUBLIC PARTICIPATION

Background

A highlight of Montana government is an emphasis on public participation in its decision making processes. The right to participate in government decisions is established in Montana's Constitution (Article II, section 8) and in the Public Participation Law (MCA 2-3-101 to 114) which governs the activities of state agencies. An example of this right is the 30-day public comment period that is required prior to issuance of all Montana Ground Water Pollution Control System permits.

Advisory committees and oversight boards are common. They are composed of agency representatives and members of the public. For example, the Board of Health oversees the activities of the DHES.

When the Water Quality Bureau started a Wellhead Protection Program in May 1991, the Director of the DHES appointed a Wellhead Protection Advisory Committee to recommend a program uniquely suited to Montana. The members meet the following criteria:

- They are interested in protecting Montana's groundwater resource,
- They are available to meet quarterly for one day at a central location,
- They deal with the resources or issues that will be addressed in a groundwater protection program,
- They represent a unique area or community in the state that uses groundwater as a public drinking supply,
- They work in one of the following areas: legislature, local government (elected official), sanitarian, public water supply, health profession, planning board, small business, agriculture, education, environmental protection, state agency dealing with groundwater resources.

The role of the Advisory Committee is to oversee the creation and implementation of Montana's Wellhead Protection Program. They will:

- consider the various ways a wellhead protection program can operate and select the best option for Montana,
- outline a plan of action for implementing a statewide wellhead protection program,
- develop criteria to prioritize public water supplies for development of wellhead protection areas,
- suggest ways to enhance public support for wellhead protection areas,
- advise the Wellhead Protection Coordinator on potential problems and suggest appropriate solutions.

The committee meetings are open to the public and many citizens have attended. The members of the Wellhead Protection Advisory Committee are:

Carolyn Colman, Mayor, West Yellowstone
Valerie J. Counts, Park County Planning Director, Livingston
Diana C. Day, Small Business Owner, Harlowtown
Ethel Harding, State Senator, Polson
Vern K. Heisler, Water Quality Bureau, Billings
Arvid M. Hiller, Mountain Water Company, Missoula
Ed Hillman, ESD, Inc. (Well Drilling), Livingston
Debi Madison, Ft. Peck Tribal Office, Poplar
Lyle Quick, Northern Plains Resource Council, Circle
Sam Rodriguez, DNRC Regional Office, Lewistown
Gerald Smith, Rancher (Certified Water System Operator), Galata
Ward Swanser, Attorney, Billings
Melissa Tuemmler, City/County Health Department, Great Falls
Wayne Van Voast, Bureau of Mines and Geology, Butte

Several press releases have described the events associated with establishing the Montana Wellhead Protection Program. A mailing list was established of interested Montanans. Those on the list have received information from the Water Quality Bureau and the Wellhead Protection Advisory Committee at each stage of the development of this document. Many have responded to requests for comments with many ideas that have been incorporated into the policy direction of the committee and final draft of this document.

Public Comments on Draft Policy Statement of the Wellhead Protection Advisory Committee

Comment 1: "As I understand the objectives of Phase 1, the committee intends to educate the public at large on the scientific and social issues involved in the Wellhead Protection Program. This will require a very aggressive program if you hope to accomplish it within two years. Three to four years, at minimum, seem more realistic when the manpower and fiscal constraints are properly weighed." **Answer:** The timing of the phases has proved troublesome to many commenters. For this and other reasons raised by the committee, the concept of phasing in the program has been dropped.

Comment 2: "I feel the key ingredient to a state program is flexibility. The program should be able to accommodate a variety of hydrogeologic conditions and community needs. My only real concern is the seven year timetable. With the heightened awareness that many people have regarding water quality, I am compelled to believe that the likelihood of public acceptance and the potential for funding would significantly shorten the length of time needed to reach Phase 3. My experience with the Missoula program suggests that many Montana citizens are cognizant of water quality issues and favor wellhead and aquifer protection. Public education via news accounts of contaminant spills is probably the catalyst for this public concern." **Answer:** The timing of the phases has proved troublesome to many commenters. For this and other reasons raised by the committee, the concept of phasing in the program has been dropped.

Comment 3: "I would recommend caution in establishing 'instant' Wellhead Protection Areas for every community water supply well. This practice may be at odds with a later stated goal of designing legally and scientifically defensible Wellhead Protection Areas. Equally important, I believe it may set the wrong tone and discourage public involvement early in the process, giving the impression that from the start, this is a state-run program and will be something they have little say over." **Answer:** The committee dropped the concept of "instant" Wellhead Protection Areas.

Comment 4: "I agree that the Water Quality Bureau should encourage public water suppliers to begin their own voluntary Wellhead Protection Programs. In fact, when the word gets out, you may find several communities which you cannot hold back. I would think that much of the responsibility for voluntary action would come from cities relying on groundwater supplies, rather than county governments." **Answer:** The committee has broadened the list of locals governments which may establish a wellhead protection area.

Comment 5: "Regarding the third paragraph in Phase I, I would agree that a major share of the state's work at this stage should be in screening, ranking and targeting communities statewide drawing groundwater from aquifers amenable to wellhead protection practices and in the most need of protection." **Answer:** Risk assessment was given even greater emphasis in the final policy statement.

Comment 6: "In Phase I, paragraph four, I wholeheartedly agree that the Wellhead Protection Program must be legally and scientifically defensible. While cities and counties have broad powers to enact ordinances and other tools of self-government, many of the applications in the area of wellhead protection are untested, and aggressive rule making may be met with litigation. I believe your emphasis on the educational program to inform the public on the issues involved in the Wellhead Protection Program should be the second primary focus of Phase I efforts." **Answer:** The final policy statement equally emphasizes coordination, technical assistance, education, and risk assessment.

Comment 7: "Following the development of some suitable introductory material on the Wellhead Protection Program, making direct contact with key individuals and groups interested in groundwater protection and municipal planning is an excellent idea. You may wish to consider establishment of some kind of speakers' bureau to target key communities and groups once the initial screening has been accomplished." **Answer:** A speakers' bureau of Water Quality Bureau staff is available to speak to groups about wellhead protection.

Comment 8: "I had some trouble understanding the link between Phase I and Phase II efforts as outlined in the Draft Policy Statement. I would suggest that in addition to the above, that the next one to three years be used to foster the successful completion of one or two Pilot Wellhead Protection Programs in the state. I believe that an unproven and relatively unknown program of this type will require some successful local models as patterns. Community leaders from these communities successful in establishing wellhead protection programs serve as excellent spokespersons and resources for other communities, because, although the Wellhead Protection Program has a technical foundation, the implementation relies primarily on educational, economic, and political approaches." **Answer:** Pilot projects, as you have suggested, are underway in Missoula and Polson. The Mayor of Sheridan, for instance, has appeared at several training sessions to describe his groundwater protection program and the development of a model ordinance.

Comment 9: "I noticed a couple of elements in Phase II which I would suggest moving to Phase I, including the holding of public hearings throughout the state, and the introduction of legislation to target at least a modest amount of matching monies for Pilot Wellhead Protection efforts. I believe that holding public hearings at this time would help bring public attention to the issue and demonstrate that the concept of wellhead protection can be seized upon by any interested community, and that some benefits may be accomplished, even in the absence of substantial government funding." **Answer:** Public hearings have been scheduled for May and June of 1992.

Comment 10: "It is not clear how the program is currently being funded. If legislation is required to authorize the statewide program and provide state financing, I would think this would be one of the goals under Phase 1 and not Phase 2." **Answer:** The timing of the phases has proved troublesome to many commenters. For this and other reasons raised by the committee, the concept of phasing in the program has been dropped.

Informational Meetings and Public Hearing

Seven informational meetings are scheduled to explain the Montana Wellhead Protection Plan to interested members of the public, answer questions, and take written comments and suggestions for changing the draft plan.

May 27, 1992 - Lewis and Clark County Library, 120 S. Last Chance Gulch,	Helena
May 28, 1992 - Great Falls Public Library, 301 Second Ave N,	Great Falls
June 2, 1992 - Missoula Public Library, 301 E Main Street,	Missoula
June 3, 1992 - Bozeman Public Library, 220 E. Lamme,	Bozeman
June 8, 1992 - Community Room, Courthouse 207 West Bell,	Glendive
June 9, 1992 - Parmly Public Library, 510 N. Broadway,	Billings
June 10, 1992 - Flathead County Public Library 247 First Ave E,	Kalispell

Public Comments on the Draft Montana Wellhead Protection Program

(Comments and responses to be added after public meetings and close of comment period.)

Public Hearing on the Final Montana Wellhead Protection Program

A public hearing will be held on July 10, 1992, in conjunction with the Wellhead Protection Advisory Committee meeting to take comments on the final version of the Montana Wellhead Protection Program that will be submitted to the EPA for approval. The hearing will start at 9:00 am in Room C-209 of the Cogswell Building, 1400 Broadway, Helena, MT.

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Public Meetings for Montana's Wellhead Protection Program

Wellhead protection is a program established by the 1986 Amendments to the Federal Safe Drinking Water Act to prevent contamination of groundwater used for public drinking water supplies. The legislation encourages states to design and implement their own Wellhead Protection Program.

A summary of Montana's program is included with this notice. Copies of the complete Montana Wellhead Protection Program may be obtained from your public library or by contacting the Water Quality Bureau, Cogswell Building, Room A-206, Helena, MT 59620 (phone 444-2406).

The following public meetings will begin at 7:00 pm and are held to explain the program, answer questions on how your community can implement wellhead protection, and take comments on how to improve the program.

May 27, 1992 - Lewis and Clark County Library,
120 S. Last Chance Gulch, Helena

May 28, 1992 - Great Falls Public Library,
301 Second Ave N, Great Falls

June 2, 1992 - Missoula Public Library,
301 E Main Street, Missoula

June 3, 1992 - Bozeman Public Library,
220 E. Lamme, Bozeman

June 8, 1992 - Community Room, Courthouse
207 West Bell, Glendive

June 9, 1992 - Parmly Public Library,
510 N. Broadway, Billings

June 10, 1992 - Flathead County Public Library
247 First Ave E, Kalispell

Montana's Wellhead Protection Program Summary

The draft Montana Wellhead Protection Program is being submitted for EPA approval in compliance with Section 1428 of the 1986 Amendments to the Safe Drinking Water Act. This law requires that states adopt a program to protect groundwater, used as public drinking water supplies, from contaminants which may have any adverse effect on human health. The Water Quality Bureau, Department of Health and Environmental Sciences (DHES), has been authorized to implement this program. Montana's program will cover all lands within the state, both public and private, except the seven Indian reservations.

The Montana Wellhead Protection Program will be a voluntary program that emphasizes local control. Because remediation of groundwater contamination is not economically viable, prevention of contamination is better than remediation. Education of the general public and training for professionals working with drinking water systems will be emphasized in the development of Montana's Wellhead Protection Program.

The Montana Wellhead Protection Program will be evaluated on seven criteria:

1. Does the program define the roles and duties of state agencies and local governments, as well as provide for coordination?

2. Does the program select delineation methods suitable to define wellhead protection areas based on reasonably available aquifer information?

3. Does the program provide for an inventory of potential sources of contamination within the wellhead protection areas and a method to compile the information for statewide use?

4. Does the program provide for effective management of the wellhead protection areas to assure that public water supplies will not become contaminated?

5. Does the program outline contingency plans to assure alternative drinking water supplies in case a well becomes contaminated?

6. Does the program assure that new well sites are selected to maximize yield and minimize potential contamination?

7. Does the program involve the public at all levels of plan development and implementation?

Roles and Duties of State and Local Government

- Local government participation in the Montana Wellhead Protection Program is voluntary. A local government entity that elects to establish a wellhead protection area around its public water supply well or spring will coordinate delineation of the wellhead protection area and the inventory of potential contaminant sources, provide and administer the funding, manage the protection area, and plan for future water supplies.

- The Water Quality Bureau, DHES will coordinate the Montana Wellhead Protection Program with local governments, other state and federal agencies, Indian tribal governments, bordering states and Canada.

- Technical assistance will be provided to local governments by the Water Quality Bureau, the Montana Bureau of Mines and Geology (MBMG), the Water Management Bureau of the Department of Natural Resources and Conservation (DNRC), and the Natural Resource Information System (NRIS) of the State Library. Technical assistance will include delineation of the wellhead protection area and risk analysis of the aquifer's susceptibility to contamination.

- A Technical Guide for local communities will be prepared jointly by the Water Quality Bureau and MBMG. The guide will list the requirements for certification of the wellhead protection area by the Water Quality Bureau. Certification of the wellhead protection area is required for the community to apply for susceptibility and use waivers to monitoring requirements established by the EPA or to nominate lands within the wellhead area for the Conservation Reserve Program (CRP).

Delineation of Wellhead Protection Areas

- Wellhead protection in Montana will address aquifers tapped by wells, infiltration galleries, radial collection wells, and springs that serve public drinking water supplies. Over 75% of these supplies obtain groundwater from Quaternary alluvial aquifers.

- Montana's public water supplies from groundwater sources will be separated into three groups. Group 1 will be noncommunity public water supplies serving a population of 25 or more people. Group 2 will be public water supplies having 10 to 4,999 service connections. Group 3 will be public water supplies having 5,000 or more service connections.

- Group 1 may delineate a wellhead protection area by including the area at least 100 feet around the wellhead. Where greater protection is appropriate due to the vulnerability of the water supply, the area may extend to at least 2,500 feet around the wellhead. This group may opt to use any other method of delineation to define their wellhead protection area more scientifically.

- Group 2 may delineate a wellhead protection area nearest to the well as specified for Group 1. A second management area should extend out to the physical and hydrologic

boundaries that limit groundwater flow into the well or should be defined as the area of groundwater flow that will enter the well within 100 days of continuous pumping. This group may opt to use any other method of delineation to define their wellhead protection area more scientifically.

- Group 3 may delineate a wellhead protection area nearest to the well and a second management area as specified for Group 2. If a specific contaminant is known to threaten a public water supply, a third management area should extend beyond the area needed to intercept or dilute the contaminant before it enters the well. This group may opt to use any other method of delineation to define their wellhead protection area more scientifically.

- In bedrock or confined aquifers, which are used by less than 25% of the municipal water supplies, the wellhead protection area nearest to the well or spring will be defined as specified for Group 1. For Groups 2 and 3, a second management area should extend out to the physical and hydrologic boundaries that limit groundwater flow into the well or spring. Groups drawing water from these aquifers, may opt to use any other method of delineation to define their wellhead protection area more scientifically.

Inventory of Potential Contamination Sources

- Potential sources of contamination in the wellhead protection area will be inventoried by the local government preferably using volunteer help from the senior citizens in the community.

- The inventory will group potential contaminant sources according to whether they exist on the land surface, in the soil above the water table, or below the water table.

- To certify the wellhead area, the results of the inventories will sent to NRIS to be compiled for statewide use. The information acquired will be analyzed by the Water Quality Bureau to evaluate the potential risk to the state's aquifers and to suggest appropriate management options to prevent contamination.

- The inventory of each certified wellhead protection area will be updated every five years and submitted to NRIS.

Management Approaches

- On the state level, coordination, technical assistance, education, and risk assessment will be the methods used to manage the statewide program. Public education, information dissemination, and water supply operator training will be the most conspicuous part of the program. The Water Quality Bureau will work closely with private and public organizations interested in promoting groundwater protection.

- On the local level, management options include but are not limited to developing design and operating standards, encouraging the use of best management practices and other voluntary actions, purchasing property and development rights, creating a local water quality district, monitoring groundwater quantity and quality, educating the public, passing zoning ordinances, regulating subdivision development, reviewing site plans, instituting source prohibitions and permits, and petitioning for sole source aquifer designation.

- As local governments identify areas where legislation is needed to allow them to effectively manage their wellhead protection areas, the Water Quality Bureau will coordinate the introduction of such legislation and support its passage.

- In order to certify the wellhead protection area with the Water Quality Bureau, the managing government entity should set goals and time frames for gauging the success of their protection efforts. The community should develop a management plan to assure the site and groundwater does not become contaminated.

Development of Contingency Plans

- The Department of Military Affairs, Disaster and Emergency Services Division and the DHES will coordinate federal, state, and local services during emergencies.

- Disaster and emergency services at the county level will respond to protect public health during natural or human-caused disasters or emergencies. In addition, they are charged with promoting disaster prevention, planning, training, public education, and development of a comprehensive disaster and emergency plan. They also maintain a survey of industries, resources, and facilities within the state.

- The Water Quality Bureau, in conjunction with the Department of Military Affairs, maintains a Hazardous Materials Emergency Response System. The phone number is 444-6911 and is staffed 24 hours a day. All spills or releases of hazardous materials or other wastes, regardless of size, that pollute or threaten to pollute state waters must be reported, contained, removed and disposed of to protect water quality.

- Long-term response to a disaster usually involves testing the public water supply and providing a community with potable water if their water supply is contaminated. New sources would be developed if the old supply must be abandoned.

New Wells

- Construction standards for new wells are currently being revised and incorporated into rules by the Board of Health and Environmental Sciences. For new public water supply wells, the rules will require the submission of plans and specifications to the Water Quality Bureau prior to construction. Consultation will occur on proposed well location and the potential for contamination within an area 2,500 feet around the new well. The

regulations will require that the water supply system control a 100-foot radius around the well by ownership, zoning, easements, lease, or other means.

- Each public water supply, not currently grandfathered from the proposed revisions, must have two sources of water supply. One acts as a back up when the other is down for maintenance or repair.

- Before anyone can drill a new well that will yield more than 35 gallons per minute, the owner must obtain a permit to appropriate water from the DNRC.

- In order to certify a wellhead protection area, alternative locations for new wells should be sought. The area within a 2,500-foot radius of each location should be inventoried for potential sources of contamination. The community should develop a management plan to assure the site and groundwater does not become contaminated. If the community owns or controls the site, they should prohibit new sources of potential contamination being placed near the site. The community should seek a water right reservation from DNRC.

Public Participation

- The Board of Health and Environmental Sciences oversees the activities of the DHES. The board will establish any regulations needed to implement the Montana Wellhead Protection Program.

- In May 1991, the Director of the DHES appointed a Wellhead Protection Advisory Committee to recommend a program uniquely suited to Montana. The committee meets quarterly and the meetings are open to the public.

- Copies of the *Montana Wellhead Protection Program* are available for public review at all Montana public libraries. Copies of this summary were mailed to all community public water supply systems and interested members of the public. Public meetings are scheduled for Helena, Great Falls, Kalispell, Missoula, Bozeman, Glendive, and Billings in May and June.

- A public hearing will be held on July 10, 1992, in conjunction with the Wellhead Protection Advisory Committee meeting to take comments on the final version of the Montana Wellhead Protection Program that will be submitted to the EPA for approval. The hearing will start at 9:00 am in Room C-209 of the Cogswell Building, 1400 Broadway, Helena, MT.